The Value of Offshore Secrets: Evidence from the Panama Papers

James O'Donovan[†] *INSEAD*

Hannes F. Wagner[‡] *Bocconi University*

Stefan Zeume [†‡] *University of Michigan*

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Abstract

We use the data leak of the Panama Papers on April 3, 2016 to study whether and how the use of secret offshore vehicles affects firm value. The data provide insights into the operations of more than 214,000 offshore vehicles incorporated in tax havens by the Panama-based law firm Mossack Fonseca & Co. We find that the leak erases US$135 billion in market capitalization among 397 public firms that we trace as users of offshore vehicles exposed in the Panama Papers. Firm value declines only when offshore activities are previously secret. In addition, we show that the leak reduces the net benefits of using secret offshore vehicles to bypass anti-bribery regulations and evade taxes. Taken together, firms use secret offshore vehicles for value-enhancing but potentially illegal activities that go beyond tax avoidance. Offshore intermediaries facilitate such activities.

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[†] Department of Finance, INSEAD, james.odonovan@insead.edu.
[‡] Department of Finance, Bocconi University, hannes.wagner@unibocconi.it.
[‡†] Department of Finance, University of Michigan, zeume@umich.edu.

What do firms do that neither investors nor regulators know about? Regulatory and voluntary disclosure suggest ever greater transparency of modern corporations. At the same time, firms spend considerable effort on deliberately concealing some of their activities. Investors care about firms' secrets because they may create or destroy value, and regulators are concerned that firms hide potential violations of rules and regulations.

There is broad agreement among the Federal Reserve, IMF, World Bank and OECD that a key enabler of corporate secrecy is the offshore world. Under the veil of secrecy provided by tax havens, firms can finance corruption, evade taxes, and tunnel resources into managers' pockets. Whether these secret offshore activities are beneficial to shareholders or not is the question we attempt to answer in this paper.

By definition, providing evidence on secret offshore activities is challenging because such activities are inherently unobservable. To tackle this observability problem, we use event study techniques and exploit the largest offshore data leak to date, the 2016 leak of the Panama Papers. On April 3, 2016, the news media started reporting a leak of confidential documents concerning the business activities of Mossack Fonseca & Co., a Panama-based law firm and provider of corporate services. These so-called Panama Papers comprise 11.5 million documents and provide insights into the operations of over 214,000 shell companies, incorporated in tax havens around the world over the past 45 years. Thousands of news reports from over 100 media organizations with access to the Panama Papers data stressed that the use of offshore vehicles goes well beyond tax avoidance.[1]

Judging from the news reports following the Panama Papers leak, the most popular uses

[1] See, for example, "The Panama Papers: How the world's rich and famous hide their money offshore," April 3, 2016, *The Guardian* (retrieved April 14, 2016).

of secret offshore vehicles among publicly traded firms are the financing of corrupt activities and tax evasion.[2] Two examples of large public firms that were linked to corruption by the Panama Papers received particularly wide news coverage. One firm, a German conglomerate, used offshore vehicles, some of them operated by Mossack Fonesca & Co., to run slush accounts that were used to bribe government officials. Another firm, an Italian contractor, used shell companies incorporated by Mossack Fonseca & Co. to pay close to US$ 300 million in bribes to win contracts for oil and gas pipelines. In addition to these cases of violations of anti-bribery regulations, the leaked data have prompted thousands of national tax evasion investigations and the creation of an international taskforce involving tax agencies from 30 countries.[3]

In theory, the unexpected leak might negatively affect firm value if it reduces future benefits from bribe payments or tax evasion. Similarly, the leak might be associated with costly regulatory fines for such activities in the past. Lastly, firm value could also decrease if firms experienced reputational losses from the leak. However, the leak might also have led to an increase in firm value. For instance, if offshore structures were used to tunnel resources out of the firm at shareholder expense, the transparency brought about by the leak might have reduced such costly activities (e.g., Desai, Dyck, and Zingales 2007).

We base our empirical analysis on a unique database of publicly traded firms that we connect to the Panama Papers. Specifically, we start with 23,540 publicly traded firms from 73 countries, with a total of 530,393 subsidiaries across 211 sovereign and non-sovereign territories

[2] Outside the scope of our paper, the Panama Papers also contain data on the use of offshore vehicles by individuals and legal entities other than publicly traded firms (such as private firms and governing bodies). Additional uses by these other parties include fraud, evasion of sanctions, and money laundering.

[3] In January 2017 this taskforce met to share results on thousands of investigations sparked by the Panama Papers. The taskforce, involving most OECD member countries, has not disclosed details of the meeting (see e.g. icij.org/blog/2017/01/tax-agencies-draw-target-list-offshore-enablers). Multiple authorities have publicly stated to have launched civil and criminal tax evasion investigations in relation to the leaked data. As of October 2016, these included authorities in Australia, Canada, Denmark, France, Germany, India, Israel, Malta, Norway, Pakistan, Singapore, Spain, Sri Lanka, Sweden, Thailand, and the United States.

and more than 1.8 million directors. These are obtained from publicly available data sources. We then match these subsidiaries, directors, and directors of subsidiaries of public firms to the leaked data, which contain information on 212,845 entities incorporated by Mossack Fonseca & Co. over the past 45 years, their 144,791 officers, and 12,599 intermediaries. Our matching process, which we describe in detail below, identifies 397 public firms as users of offshore vehicles incorporated by Mossack Fonseca & Co. These firms are spread across the globe and operate in a wide range of industries. The firms tend to be large, have more international operations, and are more exposed to perceptively corrupt countries, particularly those where high-ranked government officials are implicated by name in the leaked data.

Our results show that the 397 firms connected to the Panama Papers experience significantly negative returns around the event dates associated with the leak. These event dates are April 3, 2016 (news organizations start reporting the leak), April 26, 2016 (the International Consortium of Investigative Journalists (ICIJ) announces a database of the leaked data will be made public), and May 9, 2016 (the database is made public). In economic terms, the leak wiped out US$135 billion in market capitalization among firms with exposure to the revelations in the Panama Papers.[4] This reflects a drop in firm value of 0.7% relative to same-country and same-industry firms without such exposure. Our results are robust to alternative event windows, alternative risk adjustments, and to matched sample analysis.

Next, we investigate whether our main effect—the drop in value of firms with exposure in the Panama Papers—is driven by previously observable or secret offshore activities. Most but not all offshore activities that came to light through the Panama Papers are unobservable prior to

[4] For this calculation, we multiply each firm's market valuation at the end of 2015 by its cumulative abnormal return during our event windows. We obtain quantitatively similar results when we instead multiply firms' market value at the end of 2015 by the average percentage drop in firm value net of country and industry fixed effects.

the leak. We find that firms are adversely affected by the leak only when their offshore activities are likely to have been secret prior to the leak. Along similar lines, we also show that our effect is distinct from a negative market reaction around the leak for firms that have any type of tax haven exposure. Taken together, these results indicate that the negative market response for firms with exposure in the Panama Papers stems at least in part from the revelation of firms' use of secret offshore vehicles.

We further assess whether the negative market impact is more pronounced among firms for whom stronger regulatory enforcement in response to their exposed offshore activities is plausibly expected. We find that the negative market reaction is larger for offshore vehicle users that are U.S.-based, that have U.S. subsidiaries, and that have sponsored ADRs outstanding. All three characteristics expose firms to potential U.S. enforcement actions, in response, for example, to violations of the Foreign Corrupt Practices Act (FCPA) or tax evasion regulations.

Next, we explore three potential causes of the negative market response – corruption, taxes, and reputation. Considering the corruption channel first, firms may use secret offshore vehicles to finance bribe payments to win contracts tendered by corruptible government agents, and thereby create firm value (Beck and Maher 1986, 1989). The leak may result in fines for past violations of anti-bribery regulations, and the increased threat of discovery of secret offshore vehicles may discourage corporations from using them to pay bribes. We find that firms exposed in the leak are more negatively affected when they are also exposed to perceptively corrupt countries, and to countries where country leaders are identified as users of secret offshore vehicles in the leaked data. For instance, around the leak, firms exposed in the leak and with a subsidiary in one of ten countries where country leaders are implicated by name are 0.9% more negatively affected than other firms exposed in the leak. This effect is similar in magnitude

among firms exposed to the most perceptively corrupt countries.

Second, we examine the potential role of taxes. Tax aggressive firms may use secret offshore vehicles to evade taxes, and thereby create firm value. We measure tax aggressiveness as that part of the statutory tax rate less firms' effective tax rates that is unexplained by firms' performance, industry, and country characteristics. Due to the breadth of our sample—over 23,000 firms headquartered in 73 countries—this metric is somewhat general and may capture both tax avoidance and tax evasion. The surge in tax evasion investigations in relation to the leaked data is suggestive evidence that the leaked data reveals instances of tax evasion rather than merely instances of legal tax avoidance.[5] We find that tax aggressive firms connected to the Panama Papers are significantly more negatively affected by the leak.

Third, we consider whether firms incur reputational losses due to the data leak. Given the intense media coverage of the leak, revealing a firm's use of secret offshore vehicles for illegal or at least perceptively unethical purposes might create reputational losses—more so for firms with good reputations. We measure firm reputation using a range of corporate social responsibility ratings, and find evidence that high reputation firms are significantly more negatively affected when implicated by the leaked data. Thus, investors appear to price reputational losses due to the leak. In economic terms, for firms exposed by the Panama Papers, a one standard deviation increase in reputation is associated with losing 1% more in firm value.

Our interpretation of the drop in firm value of implicated firms is that activities such as bribery and tax evasion create shareholder value prior to the leak. The revelations of the Panama Papers destroy some of that value, and result in reputational losses. As previously stated, the

[5] We use the term tax evasion broadly, to include the whole spectrum of actions aimed at reducing taxes, ranging from less aggressive and more likely legal tax avoidance to more aggressive and more likely illegal tax evasion. As Hanlon and Heitzman (2010) note, the degree of legality of tax transactions is often determined after the fact.

sources of value destruction could be twofold: expected future cash flows from financing corruption and tax evasion may be lower, or regulatory fines may result from such activities in the past. While we cannot distinguish these two empirically, the average firm in the sample loses US$340 million in value, which by magnitude seems unlikely to be due strictly to fines.[6]

We consider three alternative interpretations for the negative market response by firms exposed in the Panama Papers. First, offshore structures may have been used not in the interest of shareholders but to tunnel resources out of the firm. Consistent with this, a small number of news stories have reported cases where Mossack Fonesca & Co. vehicles were used for tunneling. However, if the leak primarily uncovers and reduces such value destroying activity, on net firms exposed to the leak should be positively affected, counter to our finding.

Second, we find that firms exposed to the Panama Papers are larger and more likely to have activities in more corrupt countries. Thus, these firms may experience negative returns for reasons related to these different characteristics but unrelated to the leaked data. Yet we find that all of our results are robust to matching firms on observable characteristics.

A final alternative is that, following the leak, firms' exposure to tax havens as a risk factor becomes more salient for outside investors. While we find support for an offshore discount following the leak, this effect is separate from our baseline results: Firms that have publicly observable subsidiaries in the Mossack Fonseca & Co. tax havens but do *not* use secret offshore vehicles, are less adversely affected than firms that are directly implicated by the leaked data.

We contribute to several strands of the literature. To our knowledge, we are the first to identify almost 400 international corporations, or 1.7 percent of all listed firms, as users of

[6] US$135 billion/397 firms=US$340 million. We also test whether the decline in firm value is caused by an increase in firms' cost of capital, and do not find evidence of changes in equity betas in firms with Panama Papers exposure.

Mossack Fonseca & Co. offshore vehicles. For the vast majority of these—79 percent—the existence of these vehicles was likely entirely secret. Prior work has focused on observable offshore activities, using data on multinational affiliates of firms (Faulkender and Smith 2016), subsidiaries of U.S. firms from 10-Ks (Dyreng and Lindsey 2009), subsidiaries of global firms (Bennedsen and Zeume 2016), or detected tax shelter cases from news reports (Graham and Tucker 2006). While self-reported or detected offshore activities help identify costs and benefits associated with tax haven activity, such activities may differ from undetected ones along dimensions that correlate with how they create firm value. We rely on firms that are detected for an exogenous reason, a leak in the offshore service provider's data in this case.

Additionally, self-reported data generally do not allow analysis of specific illegal activities, such as financing corruption. Consequently, the tax haven literature focuses on tax avoidance, with Hanlon, Lester, and Verdi (2015) and Bennedsen and Zeume (2017) being important exceptions.[7] While we confirm tax motives as one driver of offshore activities, we additionally shed light on the more illegal activities, such as financing of bribes. The bribery literature has so far documented the effect of bribes on firms from detected cases (e.g., Karpoff, Lee, and Martin 2008, 2015, Karpoff et al. 2017, and Cheung, Rau, and Stouraitis 2012) and regulatory changes in the U.K. (e.g., Zeume 2017). Our results suggest the importance of secret offshore entities in financing bribe payments.

More broadly, we can estimate the true extent to which firms use secret offshore vehicles using two illustrations. First, among the world's largest 1,000 firms, the user rate of secret offshore vehicles is at least 8.4 percent, or one in twelve such firms. Second, since Mossack

[7] Hanlon and Heitzman (2010) provide a literature review on tax avoidance, including the use of tax havens. Along similar lines, Tax Information Exchange Agreements (TIEAs), which allow tax authorities to exchange information with tax havens, have been shown to affect round-trip tax evasion (Hanlon, Maydew, and Thornock 2015) and bank deposits (Johannesen and Zucman 2014). Others have documented that tax avoidance, measured by the book-tax gap, is positively associated with firm value among strongly governed firms (Desai and Dharmapala 2005).

Fonseca & Co. is not the only offshore service provider, users of offshore vehicles might still go undetected. While estimates of the size of the offshore service market differ, sources agree that the company held a mere 5-10% of the global market for shell companies at the time of the Panama Papers leak.[8] Assuming that firms use offshore service providers mutually exclusively, the use of secret offshore vehicles would then lie in between 13% and 26%.[9] For comparison, Dyck, Morse, and Zingales (2014) estimate that roughly one in seven U.S. corporations likely engage in accounting fraud.

Finally, our paper contributes to quantifying the economic impact of data leaks. In recent years, corporate data breaches have increased dramatically in scope and size. Estimating the cost of a leak is often challenging, especially since the value of affected firms may change due to other idiosyncratic news. The Panama Papers are unusual in that they affect hundreds of firms through a leak in an intermediary.[10] The overall losses of U.S. $135 billion in market capitalization in response to the leak far exceed those attributed to recent major data leaks involving Anthem, Citigroup, Ebay, Home Depot, JPMorgan Chase, Sony, Target, and Yahoo. The results highlight that the indirect costs of data breaches can be economically significant.

Taken together, in this paper, we provide novel large-scale evidence on the use of secret offshore vehicles. We also highlight the role played by offshore intermediaries, such as Mossack Fonseca & Co., in facilitating some illegal firm activities. In this highly specialized market, one determinant of firms' willingness to pay may be that such activities typically create shareholder value when undetected.

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[8] See, for example, "A torrential leak, " April 9, 2016, *The Economist* (retrieved April 14, 2016). No revenue data of any type are available for Mossack Fonseca. The global market for corporate services in 2014 was estimated to be roughly US$ 6 billion (EUR 5.6 billion, see Intertrust IPO prospectus, 5 October 2015, p. 120).

[9] 1.3%/10%=13% and 1.3%/5%=26%. These second estimates are necessarily rough.

[10] The literature on whistle blowers, for instance, has relied on collecting information about many individual leaks affecting one firm at a time (e.g., Dyck, Morse, and Zingales 2010). One recent paper has made use of the features of the Panama Papers leak to show that offshore incorporation activity is associated with OECD information exchange initiatives (Omartian 2017).

1. The Panama Papers data leak, methodology, and data

In this section, we discuss the institutional details of the Panama Papers leak. We then explain our methodology and data.

1.1 The Panama Papers data leak

Among the earliest media reports of the Panama papers leak on April 3, 2016 were those concerning specific firms, country leaders, and other individuals. The leak includes an unprecedented 2.6 terabytes of data, or 11.5 million confidential documents. The documents provide insights into the uses of more than 214,000 shell companies in tax havens around the world over the past 45 years. Of the 214,000 companies that appear in Mossack Fonseca & Co.'s files, 90% were incorporated in just four tax havens: the British Virgin Islands (114,000 firms), Panama (48,000), the Bahamas (16,000), and the Seychelles (15,000). The remaining firms were incorporated in Niue (9,600), Samoa (5,300), British Anguilla (3,200), Nevada (1,300), Hong Kong (450), the United Kingdom (150), and a few other countries.

Following April 3, we identify two additional event dates relevant for our analysis: April 26 and May 9. On Tuesday, April 26, the ICIJ announced that a searchable database of the leaked data would be made public. On Monday, May 9, 2016, this searchable database was made available through ICIJ's website. The database contains information on all entities incorporated by Mossack Fonseca, as well as relationship information between entities, and individuals such as shareholders and directors attached to the entities. As we explain below, we use these data to trace how specific companies and individuals are connected to entities, individuals, and intermediaries, and thus uncover users of offshore vehicles around the world.

1.2 Data and variable construction

Our sample contains data from several sources. We trace connections to the Panama Papers data leak using the data made available by the ICIJ, as well as from subsidiary and director data of all publicly listed firms in Bureau van Dijk's Orbis database as of 2015. Accounting and market data are obtained from Datastream/Worldscope and Orbis. Appendix 1 provides a complete list of all variables used in our analysis.

1.3.1 Exposure in the Panama Papers

The data contained in the leak of the Panama Papers are unique with respect to the opportunity they provide to identify users of secret offshore vehicles. We use multiple relational data sets made available by the ICIJ on May 9, 2016, in particular, an "entities" data set containing information on companies, trusts, or funds created in offshore jurisdictions by Mossack Fonseca & Co., an "officers" data set, with data on individuals who play a role in the aforementioned entities, and an "intermediaries" data set, with data on middlemen, such as law firms or accountants, who facilitate the creation and operation of offshore entities. Using Orbis data, we connect these three ICIJ data sets to publicly listed firms in three ways: to a public firm's subsidiaries, to a public firm's directors, and to the directors of a public firm's subsidiaries.

We use fuzzy string matching algorithms to match the names of directors and subsidiaries in Orbis to potentially corresponding data in the three Mossack Fonseca & Co. databases. We require that names in Orbis and in the leaked data are associated with the same headquarters/home country, while allowing for variations in the spelling of names across data sources. Specifically, we proceed in two steps, dealing with Orbis subsidiary and officer names separately. First, we match the Orbis subsidiaries of publicly listed firms to the Mossack Fonseca & Co. data using the subsidiary name and location. Second, we match directors of publicly listed

firms from Orbis to the Mossack Fonseca & Co. data using the director name and country as identifying information. We repeat the matching of director names for directors of subsidiaries of publicly listed firms. After limiting ourselves to data with available address information, this match starts out with 212,845 entities, 144,791 officers, and 12,599 intermediaries from ICIJ's databases and on 913,819 subsidiaries and 1,879,048 directors from Orbis.

Next, we aggregate any matches between publicly available data and the leaked data at the firm level. Our first key variable of interest, *Has Panama Papers Exposure*, indicates whether (1) or not (0) any entity, intermediary, or person listed in the leaked documents is connected to a subsidiary of a firm, a director of a firm, or a director of a firm's subsidiary. In additional tests, we disaggregate *Has Panama Papers Exposure* into *Exposure of Observable Activities* and *Exposure of Secret Activities*. The former requires being connected to an entity listed in the leaked documents; such links are potentially observable because Orbis will associate them with a tax haven headquarters or home country. The latter measure, *Exposure of Secret Activities*, requires being connected to an intermediary or person in the leaked data.

To ensure that we do not falsely classify firms as being connected to the leaked documents, we verify matches manually. The number of implicated firms captured by our matching process is likely a conservative estimate of the true number of implicated firms due to different spelling and naming conventions in the ICIJ and Orbis databases. This likely biases our analysis against finding an effect because firms that are exposed by the Panama Papers but that

we cannot identify will become part of the control group.[11]

1.3.2 Measures of firm value

We measure the impact of the data leak on firm value using daily returns for [-1;3] event windows around the three event days of the leak. For Sunday, April 3, a non-trading day, we move the event date to the next trading day, Monday, April 4. We obtain daily stock prices from Datastream and apply standard data filters of dropping penny stocks (prices below U.S. $0.10), stocks not actively traded (no price changes between March 31, 2016 and April 6, 2016), and firms with assets below U.S. $5 million. We winsorize returns at the 1 and 99 percentiles to remove outliers. Besides using raw returns, we calculate one-factor alphas (i.e., stock returns in excess of market returns after controlling for firms' exposure to the market index). Alphas are obtained from a one-factor model estimated for March 4, 2015 to March 3, 2016. We require stocks to have at least 100 non-missing return observations during that period. Local market indices and risk-free rates are not available for all of the 73 countries in our sample. We therefore obtain stock prices in U.S. dollars and use the U.S. market index (CRSP Value-Weighted Return) and U.S. T-bill as market index and risk-free rate, respectively. Our results are robust to using local indices and local risk-free rates where available.

1.3.3 Other Firm Characteristics

Finally, we construct several variables to capture firms' exposure to corruption and their

[11] Some countries, such as South Korea, are underpresented among users of offshore vehicles. To alleviate the concern that our algorithms may fail to detect matches in specific geographies, for example due to inconsistent transcription of non-ASCII characters, we confirm that such countries are not only underrepresented among matches between publicly available data and leaked data, but are also underrepresented in the leaked data themsleves. This suggests that firms from such countries did not use Mossack Fonseca & Co. services in the first place (but might use other non-compromised secret intermediaries). To illustrate, for South Korea we find only 181 instances of South Korean connections in the leaked data, compared to 1,681 publicly listed firms, none of which overlap. In comparison, for the U.K., we find 15,900 instances of connections in the leaked data, compared to 1,079 publicly listed U.K. firms, of which 124 firms overlap as users of Mossack Fonseca & Co. offshore vehicles.

tax aggressiveness. All variables are measured before April 2016 to ensure that they are not affected by the Panama Papers data leak. For brevity, we focus on the main controls.

Has Political 1St Layer Exposure is a dummy variable equal to one if a firm has at least one subsidiary in any of the countries where country leaders were implicated by name in the Panama Papers. We use subsidiary data for 2015 from Orbis and media reports from early April 2016 to identify the following countries: Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, Ukraine, and the United Arab Emirates. The initial media reports focused primarily on the use of offshore vehicles by government leaders in these 10 countries. As of April 21, 2016, the list of potentially implicated individuals had grown to include politicians and other individuals from at least 40 countries, with further additions since then.[12]

To capture the idea that politicians from many more countries are likely to be implicated by the leak and that politicians from countries perceived to be more corrupt are more likely implicated, we construct *Corruption Exposure*, a dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index.

Tax Aggressiveness is the residual of a regression of firm's *Tax Aggressiveness (Unadj. Floor)* on return on assets where *Tax Aggressiveness (Unadj. Floor)* is the statutory tax rate at the country level less a firm's effective tax rate. The effective tax rate is defined as tax over EBIT; observations with negative EBIT are denoted as missing. A variation of this measure additionally controls for industry and country fixed effects when constructing the residual. As noted in the introduction, this metric is necessarily general, and likely to capture both tax

[12] Additions include Armenia, Australia, Azerbaijan, Bangladesh, Brazil, Canada, Chile, China, Colombia, Cyprus, Egypt, France, Hong Kong, India, Indonesia, Israel, Italy, Malta, Mexico, New Zealand, Norway, Pakistan, Russia, Singapore, Spain, Sweden, Switzerland, Thailand, Tunisia, the U.K., and the U.S.

avoidance and tax evasion, but accounts for profitability, as well as industry- and country-specific tax treatments.[13] Further variables of interest include firms size (total assets), the number of domestic and foreign subsidiaries of each firm, as well data on ADRs from BNY Mellon and measures of firm reputation, which we proxy using corporate social responsibility metrics from the Bloomberg Environmental, Social, and Governance (ESG) database.

1.3 Methodology

One approach to studying the value created by corporate offshore activities is to collect data from reports about detected tax haven activity. However, there are few detected cases and the firms implicated by such cases may differ from those whose secret offshore activities remain undetected along dimensions that correlate with the value they may create. To alleviate these concerns, we employ event study techniques to study the market response of firms connected to the Panama Paper data leak around the announcement of the leak.

In the first part of the analysis, we analyze the market response of firms exposed to the leak around dates relevant to it. Specifically, we run the following regression:

$$CAR_i = \alpha + \beta_1 PanamaPapersExposure_i + \gamma' \mathbf{X_i} + \varepsilon_i, \qquad (1)$$

where CAR_i denotes the cumulative abnormal return (CAR) of firm *i* around the three event days relevant to the leak, $PanamaPapersExposure_i$ indicates whether (1) or not (0) our data identify firms as users of offshore vehicles exposed in the Panama Papers, and $\mathbf{X_i}$ is a vector of controls measured before April 2016, including country and industry fixed effects. The coefficient of interest, $ß_1$, captures whether exposure in the leaked documents impacts firm value.

[13] Our results are robust when we measure tax aggressiveness as the statutory tax rate at the country level less a firm's effective tax rate. Our results are also robust when we control for country times industry fixed effects, and when we use ten-year averages of effective tax rates and profitability to construct our tax aggressiveness measure.

We augment equation (1) with firm characteristics in order to test whether certain types of activities are priced. We run the following regression:

$$CAR_i = \alpha + \beta_1 PanamaPapersExposure_i + \beta_2 FC_i + \beta_3 PanamaPapersExposure_i \times FC_i + \gamma' \mathbf{X_i} + \varepsilon_i, \qquad (2)$$

where FC_i is a firm characteristic of interest measured before April 2016. Of particular interest is β_3, which indicates whether firms exposed to the leak are differentially affected when they have specific characteristics. Equations (1) and (2) use two-way clusters (country and industry).[14]

2. Descriptive Statistics

Table 1 provides summary statistics for firms with and without exposure in the Panama Papers data leak. Panel A of Table 1 shows the number of firms connected to the leak by entity, person, or intermediary; 397 firms, or 1.7% of our sample, are connected to the data leak.

-- -- Table 1 about here -- --

We next disaggregate this connection measure; 89 firms (0.4% of the sample) are connected through the entities data, 296 firms (1.3% of the sample) are connected through the data on individuals, and 86 firms (0.4%) are connected through the data on intermediaries. Some firms are exposed to the leaked data through a combination of these individual files.

Panel B of Table 1 provides a breakdown by country, with countries ranked in declining order by fraction of firms exposed. There is substantial variation, with Hong Kong (almost one in four firms) and the U.K. (one in nine firms) ranked at the top; the U.S ranks around the middle, with roughly 2% of firms using offshore vehicles through Mossack Fonseca & Co. Among large economies, we do not find any exposure to the leak in Brazil or South Korea, and only a single

[14] We consider alternative clustering dimensions and obtained similar results. Generally, two-way clustering produces the most conservative standard errors.

firm in Japan. We selectively double-check our name matching procedure to ensure that it is not driven by different spelling conventions across data sets. Even though we cannot rule out that we miss the connections of some firms to the leaked data, such bias will only work against finding results.[15] Additionally, when we use the full data set provided by the ICIJ, we find that countries for which no firms have any Panama Papers connections by our measure rarely show up even among unmatched Mossack Fonseca & Co. data. This suggests that firms from these countries rarely used Mossack Fonseca & Co.'s services.

Appendix 2 shows results by the 47 Fama-French industries. The use of offshore vehicles is particularly pervasive in Trading, Mining, Restaurants and Hotels, Aircraft Manufacturing, and Real Estate, yet the use of offshore vehicles extends across virtually all the industries. Only five out of the 47 populated Fama-French industries in our sample are free of offshore vehicle users in the leaked data.

In Table 2, we examine the characteristics of firms with and without a link to the Panama Papers data leak. Firms connected to the leak have more subsidiaries, and more of these are foreign subsidiaries, both in absolute and relative terms. In addition, firms connected to the leak are also substantially larger; total assets average $91.6 billion, compared to $5.4 billion for firms without a connection.[16] We control for size throughout our analysis and also repeat our analysis

[15] Note that even the leaked internal data of Mossack Fonseca & Co., which are virtually perfectly suited for identifying the true owners and uses of secret offshore vehicles, do not always allow identifing ultimate beneficial owners. For example, offshore vehicles can use nominee *directors* (i.e., individuals that stand in for the true owners but exercise no real power over the firm since they have separately pre-agreed to act upon instruction of another party), and nominee *shareholders* (i.e., individuals or companies that stand in for the true shareholders but have no real power, since they have separately pre-agreed to transfer ownership to another party). A package of nominee directors and nominee shareholders, combined with a third party, such as a private bank, handling all interactions with Mossack Fonseca & Co., may hide the identity of the beneficial owner even from Mossack Fonseca itself, and therefore never appear in its internal data.

[16] A similar picture emerges when we consider market capitalization; prior to the leak, firms with exposure to the Panama Papers leak have a market value of $15.5 billion on average, while firms without such exposure have a market value of $2.1 billion on average. Market value averages are smaller than total assets since the sample contains financial firms.

using matched samples. The results of this univariate split are confirmed when we run multivariate probit regressions in which we control for industry fixed effects, country fixed effects, and size.

-- -- Table 2 about here -- --

Firms connected to the leak are also more exposed to perceptively corrupt countries on average and are more likely to have subsidiaries in countries whose politicians are implicated by the data leak than unconnected firms (32% vs. 6%). Moreover, while not significantly different in terms of tax aggressiveness, such firms are more likely to be cross-listed (19% vs. 4% for sponsored and 16% vs. 12% for unsponsored ADR) and have better corporate social responsibility performance on average than unconnected firms (overall ESG score of 35 vs. 25).

3. Market Response to the Panama Papers Data Leak

In this section, we begin by documenting our baseline effect of the Panama Papers leak on firm value, using cumulative raw and abnormal returns around the leak. We next investigate whether this baseline effect of the use of offshore vehicles is related to these vehicles being secret or not, whether the effect is separate from exposure to tax havens in general, and whether the effect is stronger for firms that are facing potentially stricter regulatory enforcement. We conclude with a battery of standard event study robustness tests.

3.1 Firms connected to the Panama Papers data leak

Table 3 shows the results of our examination of firms' exposure in the Panama Papers. The dependent variables in the regressions are *Cumulative raw return* (Raw Return) and *Cumulative abnormal return* (Alpha) around the event dates of the leak. The control variable of interest is *Has Panama Papers Exposure*, a dummy variable equal to one if a firm is connected

to the data leak. All specifications include country and industry (49 Fama-French industries) fixed effects.

--- Table 3 about here ---

Our analysis reveals that firms connected to the Panama Papers data leak have negative cumulative raw returns during the event window. As shown in Table 3, the raw returns are 1.6% lower for such firms than for same-country, same-industry firms without a connection to the data leak (column (1)). Firms with Panama Papers exposure are larger and size may be priced significantly during the event period for other reasons. Controlling for size reduces the coefficient to 1.0%, but does not affect statistical significance (column (2)).

In addition, firms with Panama Papers exposure tend to have higher market risk, and high-beta firms may have lower returns during the event period for other reasons. We therefore use *Cumulative abnormal returns* (alphas) as our dependent variable; columns (3) and (4) show that firms exposed in the leaked data are significantly negatively affected. The economic magnitude is reduced to 0.8% and 0.7%, respectively, and we conservatively treat the lowest estimate of abnormal performance, 0.7%, as our baseline estimate.

Overall, firms connected to Mossack Fonseca & Co. are adversely affected by the revelations of the Panama Papers. This may indicate that the offshore vehilces set up by Mossack Fonseca & Co. generated firm value on average.

3.2 Secret and observable offshore activities

Most but not all offshore activities revealed through the Panama Papers were unobservable prior to the leak. We therefore further investigate whether our main effect—the drop in firm value with exposure in the Panama Papers—is driven by observable or secret

offshore activities. For these tests, reported in Table 4, we distinguish how firms are connected to offshore vehicles. We capture whether the offshore activities revealed by the leak are likely to have been entirely secret prior to the leak, or whether outside investors plausibly could have inferred the existence of these activities from data that is publically available prior to the leak. Specifically, we distinguish between firms linked only to the ICIJ person or intermediary database (*Exposure of Secret Activities*), firms linked only to the ICIJ entity database (*Exposure of Observable Activities*), and firms linked to both (*Both Types of Exposure*).

--- Table 4 about here ---

The results in Table 4 show that the loss in firm value loss is driven by the revelation of secret activities. Using the full specification, firms whose secret activities are revealed by the leak lose 0.9% in firm value, while observable activities do not contribute to a loss in firm value (column (4)). Overall, this is consistent with investors pricing new information about offshore activities previously unknown to them.

3.3 Exposure to tax havens

Around the dates relevant to the data leak, exposure to tax havens as a risk factor may have become more salient for outside investors. Thus, firms with any exposure to tax havens may be adversely affected around the leak because investors factor in a larger premium for offshore risk. In Table 5, we show that while there is such a general negative market reaction by firms with tax haven exposure, the negative market impact on firms exposed in the Panama Papers is statistically and economically distinct from this general market reaction.

--- Table 5 about here ---

Specifically, we create four portfolios for our 23,540 sample firms: (1) firms with

Panama Papers exposure but no actual subsidiaries in any of the top four tax havens used by Mossack Fonseca & Co. (Panama, British Virgin Islands, Bahamas, and Seychelles); (2) firms that have such top four tax haven subsidiaries but no exposure in the Panama Papers; (3) firms that have both top four tax haven subsidiaries and exposure in the Panama Papers, and (4) the vast majority of firms that have neither. All coefficients have negative signs, but only the Panama Papers exposure coefficient is statistically significant. The coefficient for firms with Panama Papers exposure and top four tax havens exposure is larger but not statistically significant. Overall, this is consistent with investors discounting tax haven exposure around the dates relevant to the data leak, specifically exposure to tax havens heavily used by the firm at the center of the leak, but discounting firms with exposure to the Panama Papers even more.

3.4 Enforcement

We next examine whether the negative market impact of firm exposure through the Panama Papers is plausibly enhanced in our sample. We interact firms' Panama Papers exposure with three firm characteristics that expose firms to potential U.S. enforcement actions: whether firms are cross-listed in the U.S. (*Has sponsored ADR*, *Has unsponsored ADR*), whether firms have U.S. subsidiaries (*Has U.S. Subsidiary*), and whether firms are U.S.-based (*Is U.S. firm*). For cross-listings, which subject firms to U.S. regulations (see Coffee (1999, 2002) and Stulz (1999), and related evidence by Doidge (2004), Doidge, Karolyi, and Stulz (2004, 2010), and Lel and Miller (2008) ,among others], we further split ADRs into those that are unsponsored and hence subject to less stringent regulatory requirements on average and those that are sponsored and hence subject to more stringent requirements.

--- Table 6 about here ---

The results in Table 6 show that the negative market reaction is larger for offshore vehicle users that are cross-listed with sponsored ADRs, that have U.S. subsidiaries, and that are U.S. based, while there is no incremental effect for firms with unsponsored ADRs.[17] Investors therefore discount firms more if they face potential U.S. regulatory enforcement actions through U.S. investor protection laws like the 1977 Foreign Corrupt Practices Act and the 2002 Sarbanes-Oxley Act due to their appearance in the Panama Papers.

3.5 Robustness

We perform a number of robustness tests and present the results in Table 7. First, we decompose the CARs in response to the data leak into the market response on our three event dates; for the purpose of this subsection, we refer to these dates as Day 1, Day 2, and Day 3. The results, shown in columns (1) to (3) in Panel A, reveal a negative market reaction on all three days. Day 2, the day on which the ICIJ announced the future publication of a database of the leaked documents, has the economically largest negative return (0.4%). This result could be related to investor selling by those who have some knowledge of the secret offshore activities of the firms in question, or to outside investors correctly assessing the probabilities of specific firms being exposed in the ICIJ database on Day 3.

--- Table 7 about here ---

Second, rather than cumulating returns over days [-1;3] around the three relevant event dates, our results in columns (4) and (5) in Table 7 similarly hold when cumulating over days [-2;2] and [0;4] relative to the three event dates. Thus, the negative market response documented

[17] In line with prior work, we run additional tests where we further distinguish sponsored OTC-traded (Level I) from sponsored exchange-traded (Level II/III) ADRs. As expected, economically, the effect is strongest among firms with exposure to the leaked data and exchange-traded sponsored ADRs. However, the number of firms with both exposure to the Panama Papers and Level II/III ADRs is too small to allow for meaningful statistical tests.

above is not driven by abnormal trading prior to the leak. In fact, the stock market response is concentrated around days [0;2].

Third, we consider several alternative risk adjustments to the abnormal returns we obtain, as well as several ways of matching firms exposed to the Panama Papers to otherwise comparable firms (Panel B). Our baseline result is robust to these alternative specifications.

In sum, in this subsection, we have shown that our results are robust to a range of standard event study robustness tests.

4. Cross-sectional Variation in the Market's Reaction to the Data Leak

We have so far established that firms exposed to the Panama Papers experience significantly negative returns around the data leak. We examine three possible channels that contribute to this result. First, we examine whether the data leak might negatively affect firm value if it diminishes the net benefits of corruption. Second, we evaluate whether the unexpected data leak might reduce the net benefits of tax aggressiveness. Finally, we assess whether firms might suffer reputational losses from the data leak.

4.1 Financing corruption

Secret offshore vehicles may have been used to finance corruption, as was revealed by various media reports illuminating links between firms, governments, and middlemen in the Panama Papers documents. We examine whether corporations use offshore vehicles to finance corruption, and if such activities create shareholder value.

-- Table 8 about here --

The results in Table 8 show that among firms revealed in the Panama Papers, having a subsidiary in a country whose government officials are implicated by the data leak is associated

with 1.0% more negative abnormal returns (column (1)). In order to alleviate concerns that this effect is merely driven by negative news for any firm exposed to countries whose government officials are implicated by the data leak, we augment the specification to all our sample firms. Indeed, firms with exposure to such countries and revealed through the Panama Papers are still statistically and economically more negatively affected around the three event dates relevant for the data leak (columns (2)-(3)).

Next, we move to an alternative measure of exposure to perceptively corrupt countries. Notably, firms exposed in the leaked data and with exposure to the most perceptively corrupt countries are again more negatively affected (columns (4)-(6)). Specifically, being exposed to perceptively corrupt countries and the leaked data are associated with a 0.9% more negative share price response (column (6)).

These results are in line with the notion that investors believe that the Panama Papers data leak reduces firms' ability to win contracts in perceptively corrupt countries, or with regulatory fines for past violations of anti-bribery regulations. Thus, offshore vehicles that were previously unknown to the public appear to have been used to bypass anti-corruption regulations.

4.2 Tax aggressiveness

Next we examine whether tax avoidance and evasion create shareholder value—or if past tax evasion is expected to result in regulatory fines. We conduct regressions of *Cumulative abnormal returns* around our three event dates on firms' exposed in the Panama papers. The tax aggressiveness measure of interest adjusts for the country-level statutory tax rate and firms' profitability. We start by examining whether this variable provides explanatory power for the returns in the subset of firms with Panama Papers exposure.

--- Table 9 about here ---

Indeed, the results in Table 9 show that firms that are more tax aggressive have significantly more negative returns around the three event days (column (1)). Next, in order to alleviate concerns that all tax aggressive firms are adversely affected around the relevant event dates for reasons unrelated to exposure in the Panama Papers, we repeat our analysis for the full sample and confirm that tax aggressive firms only have significantly negative returns when they are also revealed through the Panama Papers (Columns (2)-(3)).

We reconfirm our previous results when we extend this analysis to an alternative tax aggressiveness measure that also accounts for the fraction of tax payments due to industry- or country characteristics (Columns (4)-(6)). Economically, a one standard deviation increase in tax aggressiveness by that measure is associated with a 0.7% (=28.6%*2.49%) more negative firm value response (column (4)), and this effect is similar in magnitude among firms revealed in the Panama Papers in the full sample of firms (columns (5)-(6)).

These results suggest that investors believe that firms will have reduced ability to (aggressively) avoid or even evade taxes in the future, and may also be faced with regulatory fines for past tax regulation violations. Put differently, offshore vehicles that were previously unknown to the public appear to have been used for aggressive tax avoidance, or even tax evasion.

4.3 Reputation

Finally, we consider whether firms incur reputational losses due to the data leak. Revealing a firm's use of secret offshore vehicles for illegal or at least perceptively unethical purposes might potentially result in significant reputational losses, particularly given the intense

critical/negative global media coverage of the Panama Papers. One example how the revelation of tax dodging can affect cash flows is provided by the 2012 customer boycott of Starbucks U.K. when it was revealed that the company had paid taxes only in one year since beginning its U.K. operations in 1998.

Measuring firm reputation is challenging for a cross-country sample. We use firm-level corporate social responsibility (CSR) performance metrics from the Bloomberg ESG database as a proxy for firm reputation. The underlying notion is that CSR investments enhance how investors, employees, and other stakeholders perceive firms. CSR is typically associated with corporate "goodness" (e.g., Hong and Kacperczyk 2009; Cheng, Hong, and Shue 2016; Dyck et al. 2016, Ferrell, Liang, and Renneboog 2016; Hong and Liskovich 2016; Lins, Servaes, and Tamayo 2017). Reputational losses, on the other hand, can be a significant driver of the negative market response around revelations and punishment for major financial misconduct by firms (e.g., Karpoff, Lee and Martin 2008) but not so much around other revelations such as environmental violations (Karpoff, Lott, and Wehrly 2005).

Bloomberg, one of the main CSR firm-level data providers, covers around 11,000 listed firms worldwide, of which roughly 3,500 have ESG scores and 2,700 overlap with our sample. Our tests on reputation only use firms with available CSR data and may not be representative of the full sample (e.g., firms with CSR data tend to be larger). We use an aggregate measure of overall CSR performance provided by Bloomberg (*Overall ESG Score*), as well as its subscores—*Environmental*, *Social*, and *Governance* performance—to proxy for firm reputation, and, as in our previous tests, interact these measures with our indicator variable *Panama Papers Exposure* (Table 10).

--- Table 10 about here ---

In Table 10, we find that high reputation firms are significantly more negatively affected when implicated in the leaked data. Thus, investors appear to associate the data leak with reputational losses. Economically, using the aggregate CSR measure, we find in column (3) that firms with one standard deviation higher reputation lose 1% (0.47*2.10%) more in value if they are revealed in the Panama Papers.

Taken together, the results suggest that investors believe that the data leak reduces firms' ability to secure contracts in perceptively corrupt countries and that firms will have reduced ability to (aggressively) avoid or even evade taxes in the future. Alternatively, regulatory fines for past tax evasion and past violations of anti-bribery regulations may result in negative market responses. Some of the drop in firm value is also due to reputational losses.

5. Conclusion

We use the data leak of the Panama Papers on April 3, 2016 to study whether and how the corporate use of secret offshore vehicles affects valuation around the world. Using event study techniques, we find that the data leak erased U.S. $135 billion in market capitalization among 397 firms that can be directly linked to the Panama Papers leak, reflecting 0.7% of their market value. Firm value declines only when offshore activities are previously unknown to the public. Moreover, firms with exposure to perceptively corrupt countries and tax aggressive firms are more adversely affected, as are firms with high reputations. Our estimate of the economic magnitude of the effect of secret offshore activities on firm value is likely conservative. The market reaction we observe is a net effect, as the leak may have positive implications for governance and transparency at least for some firms. Moreover, firms can circumvent the leak's implications by switching to other offshore service providers or constructing ever more elaborate legal structures.

We conclude that secret offshore activities created firm value by facilitating corporate bribe payments and tax evasion. The revelations of the Panama Papers destroy some of that value by reducing firms' ability to avoid taxes or finance illicit activities, or by increasing regulatory fines for past tax evasion or violations of anti-corruption regulations.

In addition to confirming by-and-large anecdotal evidence about the use of secret offshore structures for illegal activities, our paper is unique in highlighting the role played by offshore intermediaries—such as Mossack Fonseca & Co.—in facilitating illegal offshore activities. Because their illegal offshore activities may have given firms a competitive advantage over other firms, it will be interesting to see future research on the real responses by firms connected to the data leak and their competitors. We also leave it for future research to document the welfare implications of the secret use of offshore vehicles. Even though the existence of tax havens may have positive implications for regional growth (Desai, Foley, and Hines 2004), corruption, for instance, is estimated to cost US$2.6 trillion or 5% of global GDP per year (2001-2002 survey data, World Bank Institute) and reduces investment and growth (Mauro 1995).[18]

[18] Shleifer and Vishny (1993), Bardhan (1997), and Svensson (2005) provide reviews of the corruption literature.

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Table 1

Summary statistics

This table provides summary statistics of firms with and without exposure in the Panama Papers data leak. Panel A shows the number of firms connected to the leak by legal entity, person, or intermediary. Details on the procedure to establish these connections are in Appendix 1. Panel B provides the number and fraction of firms connected to the leak by country for countries with at least 50 firms; countries with fewer than 50 firms are aggregated to *Rest of the World*. All variables are defined in Appendix 1.

Panel A: Firms Exposed in the Panama Papers Data Leak

Firm is connected to offshore vehicle via	*N* Firms	*N* Firms w/exposure	% w/exposure
A legal entity (shell)	23,540	89	0.38%
A person	23,540	296	1.26%
An intermediary	23,540	86	0.37%
Any of the three	23,540	397	1.69%

Panel B: Firms Exposed in the Panama Papers Data Leak by Country

Country	*N* Firms	*N* Panama Papers Exposure	Percent Panama Papers Exposure	Avg. *N* Subs.	Country	*N* Firms	*N* Panama Papers Exposure	Percent Panama Papers Exposure	Avg. *N* Subs.
Hong Kong	161	37	23.0	46	Turkey	279	1	0.4	8
U.K.	1,080	124	11.5	40	Poland	352	1	0.3	9
Russia	100	5	5.0	33	Japan	3,442	1	0.0	16
Belgium	108	5	4.6	36	Argentina	63	0	0.0	7
Austria	66	3	4.6	77	Brazil	251	0	0.0	11
Italy	216	7	3.2	37	Bulgaria	83	0	0.0	9
France	551	17	3.1	49	Chile	111	0	0.0	14
Australia	587	15	2.6	28	Croatia	71	0	0.0	10
Greece	81	2	2.5	18	Egypt	89	0	0.0	11
Germany	493	12	2.4	61	Finland	115	0	0.0	35
Spain	124	3	2.4	86	Indonesia	56	0	0.0	11
Singapore	305	7	2.3	18	Korea	1,681	0	0.0	4
Philippines	90	2	2.2	7	Kuwait	73	0	0.0	13
U.S.	3,506	75	2.1	50	New Zealand	90	0	0.0	15
Netherlands	107	2	1.9	62	Pakistan	129	0	0.0	2
Israel	326	6	1.8	13	Peru	91	0	0.0	3
Norway	127	2	1.6	23	Romania	55	0	0.0	9
Sweden	257	4	1.6	22	South Africa	179	0	0.0	25
Canada	696	9	1.3	12	Sri Lanka	117	0	0.0	8
China	2,269	28	1.2	11	Switzerland	210	0	0.0	39
Mexico	109	1	0.9	20	Thailand	206	0	0.0	9
Denmark	111	1	0.9	27	Vietnam	385	0	0.0	1
Malaysia	602	4	0.7	14	Rest of world	637	10	1.6	18
Taiwan	1,120	7	0.6	7					
India	1,583	6	0.4	7	**Total**	**23,540**	**397**	**1.7**	**23**

Table 2

Univariate analysis

This table shows characteristics of firms with and without exposure in the Panama Papers data leak. The column labeled *Difference* captures the difference in means between the two groups. All variables are defined in Appendix 1. All continuous variables are winsorized at the 1% and 99% levels. *,**, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Sample	Firms with Panama Papers Exposure		Firms without Panama Papers Exposure		*Difference*
	N Firms	Avg	*N* Firms	Avg	
Total assets ($mn)	397	91,642	23,143	5,421	-86,200***
N subsidiaries	397	155	23,143	20.3	-134.7***
Has foreign subsidiary (1/0)	397	0.914	23,143	0.439	-0.475***
Perc. foreign subsidiaries	397	0.478	23,143	0.204	-0.274***
N foreign subsidiaries	397	16.9	23,143	2.9	-14.0***
Has sponsored ADR (1/0)	397	0.191	23,143	0.037	0.155***
Has unsponsored ADR (1/0)	397	0.164	23,143	0.049	0.115***
Has U.S. subsidiary (1/0)	397	0.413	23,143	0.176	-0.23.7***
Is U.S. firm (1/0)	397	0.189	23,143	0.148	-0.041**
Political 1st Layer Exposure (1/0)	397	0.320	23,143	0.060	-0.259***
Corruption Exposure (1/0)	396	0.449	23,083	0.146	-0.304***
Tax Aggressiveness (Unadj. Floor)	310	0.176	15,508	0.173	-0.004
Tax Aggressiveness (no FE)	310	-0.003	15,508	0.000	0.003
Tax Aggressiveness (FE)	310	-0.012	15,508	0.000	0.012
ESG Score	168	35.1	2,528	25.4	-9.7***
Environmental score	148	29.2	1,877	19.5	-9.7***
Social score	162	35.7	2,299	28.7	-7.0***
Governance score	168	56.6	2,528	49.1	-7.5***

Table 3

Abnormal returns of firms exposed in the Panama Papers data leak

This table studies returns of publicly listed firms around the Panama Papers data leak. The dependent variable is *Cumulative raw return* (Raw Return) in columns (1) and (2) and *Cumulative abnormal return* (Alpha) in columns (3) and (4). Returns are cumulated over days around three dates related to the data leak, the event window is [-1;3] with respect to each date. *Has Panama Papers Exposure* is a dummy variable that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. *Size* is the natural logarithm of a firm's assets in $000s. Appendix 1 provides variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (49 Fama–French industries) are included as indicated. Standard errors are clustered at the country and industry level (2-way cluster). *t*-statistics are in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	Raw Return	Raw Return	Alpha	Alpha
Has Panama Papers Exposure	-1.601***	-0.999***	-0.820*	-0.694***
	(-2.89)	(-2.58)	(-1.95)	(-2.62)
Size		-0.263***		-0.055
		(-3.23)		(-0.56)
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R^2	0.167	0.170	0.094	0.094

Table 4

Secret and observable offshore activities

This table provides returns of publicly listed firms around the Panama Papers data leak. The dependent variable is *Cumulative raw return* in columns (1) and (2) and *Cumulative abnormal return* in columns (3) and (4) as defined in Table 3. *Exposure of Secret Activity* is a dummy variable that takes a value of 1 if a person or an intermediary listed in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no entity in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. *Exposure of Observable Activity* is a dummy variable that takes a value of 1 if an entity in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no person and no intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. *Both Types of Exposure* is a dummy variable that takes a value of 1 if both an entity and a person or an intermediary in the leaked documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) as well as a control for size are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	Raw Return	Raw Returns	Alpha	Alpha
Exposure of Observable Activity	-0.005	0.465	0.399	0.496
	(-0.01)	(0.76)	(0.61)	(0.73)
Exposure of Secret Activity	-1.937***	-1.322***	-1.068**	-0.941***
	(-3.52)	(-3.62)	(-2.42)	(-3.63)
Both Types of Exposure	-1.244	-0.528	-0.641	-0.493
	(-1.03)	(-0.53)	(-0.92)	(-0.90)
Size		-0.262***		-0.054
		(-3.23)		(-0.56)
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R^2	0.167	0.170	0.094	0.094

Table 5

Exposure in the Panama Papers data leak and other tax haven exposures

This table provides returns of publicly listed firms around the Panama Papers data leak. The dependent variable is *Cumulative raw return* in columns (1) and (2) and *Cumulative abnormal return* in columns (3) and (4) as defined in Table 3. *Has Panama Papers Exposure* is a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. *TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has at least one subsidiary in any of the four main tax havens used by Mossack Fonseca & Co. (Panama, British Virgin Islands, Bahamas, Seychelles). *Has Panama Papers but no TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm is exposed in the Panama Papers as defined in Table 1, Panel A, (any of the three) but had no exposure to a top four tax haven. *Has no Panama Papers but TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has no exposure in the Panama Papers as defined in Table 1, Panel A (any of the three) but exposure to a TOP4 haven. *Has both Panama Papers and TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has both (1) exposure in the Panama Papers as defined in Table 1, Panel A (any of the three) and (2) exposure to a top four tax haven. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (49 Fama–French industries), as well as a control for size are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	Raw Returns	Raw Returns	Alpha	Alpha
Has Panama Papers Exposure	-1.055***		-0.728***	
	(-2.64)		(-2.69)	
Has Panama Papers but no TOP4 Tax Haven Exposure		-0.964***		-0.616***
		(-3.35)		(-2.59)
Has no Panama Papers but TOP4 Tax Haven Exposure	-0.403	-0.407	-0.243	-0.248
	(-1.50)	(-1.50)	(-1.08)	(-1.10)
Has both Panama Papers and TOP4 Tax Haven Exposure		-1.246		-0.963
		(-1.27)		(-1.27)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R^2	0.170	0.170	0.094	0.094

Table 6

Panama Papers exposure and enforcement

This table analyzes returns of publicly listed firms around the Panama Papers data leak. The dependent variable is *Cumulative abnormal return* as defined in Table 3. *Has Panama Papers Exposure* is a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. *Has Sponsored ADR* is a dummy variable equal to 1 if a firm is not headquartered in the U.S. and has a sponsored ADR (Level II or III) in 2015. *Has Unsponsored ADR* is a dummy variable equal to 1 if a firm is not headquartered in the U.S. and has an unsponsored or Level I ADR in 2015. *Has U.S. Subsidiary* is a dummy variable equal to 1 if a firm is not headquartered in the U.S. and has a U.S. subsidiary in 2015. *Is U.S. Firm* is a dummy variable equal to 1 for firms headquartered in the U.S.. *Has PPE + Interaction = 0* is a *p*-value for a test whether the sum of the Panama Papers Exposure coefficient and the respective interaction terms is zero. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) as well as a control for size are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Alpha	Alpha	Alpha	Alpha	Alpha
Has Panama Papers Exposure (PPE)	-0.503*	-0.751**	-0.076	-0.764**	0.200
	(-1.82)	(-2.57)	(-0.23)	(-2.56)	(0.39)
Has Sponsored ADR	-0.614***				-0.627**
	(-3.10)				(-2.50)
Has Unsponsored ADR		-0.395			-0.441
		(-1.13)			(-1.16)
Has U.S. Subsidiary			-0.404***		-0.338***
			(-3.73)		(-2.74)
Is U.S. Firm				-1.514**	-1.528***
				(-2.44)	(-19.58)
Has PPE x Has Sponsored ADR	-0.819**				-0.582
	(-1.98)				(-0.78)
Has PPE x Has Unsponsored ADR		0.344			0.339
		(0.73)			(0.64)
Has PPE x Has U.S. Subsidiary			-1.420**		-1.530***
			(-2.46)		(-2.72)
Has PPE x Is U.S. Firm				0.350	-0.724
				(1.06)	(-1.24)
Controls	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540	23,540
Adj. R^2	0.094	0.094	0.094	0.094	0.095
Has PPE + Interaction = 0 (p-value)	0.001	0.363	0.001	0.053	0.001

Table 7

Robustness

This table provides a breakdown of individual events associated with the data leak and alternative event windows in Panel A, and a range of robustness test results in Panel B. In Panel A, CARs are measured over each individual event day (columns (1)-(3)) and for all three event days but using a [0;4] event window around each event date (column (4)), as well as a [-2;2] event window around each event date (column (5)). In Panel B, column (1) provides robustness test results for the main specification (Table 3, Panel (4)). In column (1), all controls other than *Has Panama Papers Exposure* have been omitted from the regression. In columns (2) and (3), alpha is constructed using 3- and 5-factor models based on U.S. factor-mimicking portfolios (from Kenneth French's Data Library). In columns (4) and (5), the sample is restricted to firms exposed in the Panama Papers and firms matched by country and size (column (4)) and additionally by industry (column (5)). Firms are matched without replacement. Appendix 1 provides the variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) as well as a size control are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Market Response by Individual Event Day

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Alpha	Alpha	Alpha	Alpha	Alpha
Event days	Day 1	Day 2	Day 3	Days 1-3, Alternative event window [0;4]	Days 1-3, Alternative event window [-2;2]
Has Panama Papers Exposure	-0.156	-0.408*	-0.142	-0.740**	-0.578**
	(-0.87)	(-1.66)	(-1.16)	(-2.27)	(-2.40)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	23,540	23,091	22,980	23,540	23,522
Adj. R^2	0.086	0.050	0.140	0.060	0.052

Panel B: Robustness

	(1)	(2)	(3)	(4)	(5)
Dependent var.	1-Factor Alpha	3-Factor Alpha	5-Factor Alpha	1-Factor Alpha	1-Factor Alpha
Sample	All	All	All	Matched by Country and Size	Matched by Country, Industry, Size
Has PPE	-1.247**	-0.932***	-1.105***	-0.642**	-0.610***
	(-2.01)	(-3.00)	(-3.31)	(-2.33)	(-3.02)
Controls	N	Yes	Yes	Yes	Yes
Country FE	N	Yes	Yes	N	N
Industry FE	N	Yes	Yes	N	N
N	23,540	23,540	23,540	754	734
Adj. R^2	0.000	0.175	0.151	0.014	0.024

Table 8

Panama Papers exposure and financing corruption

This table provides the returns of publicly listed firms around the Panama Papers data leak controlling for firms' exposure to perceptively corrupt countries. The dependent variables are *Cumulative abnormal returns* around three event days associated with the leaked Mossack Fonseca & Co. documents. *Has Panama Papers Exposure* (*PPE*) is a dummy variable that takes the value of 1 if any entity, intermediary, or person listed in the leaked documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. In Columns (1)-(3), the measure of interest is *Political 1st Layer Exposure*, a dummy variable equal to one if a firm has at least one subsidiary in any of the countries whose presidents or major officials were implicated by the Panama Papers (Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, United Arab Emirates, Ukraine). In columns (4)-(6), the measure of interest is corruption exposure, measured by a dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index. Controls include size and fixed effects as indicated. Appendix 1 provides the variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Corruption Variable	Political 1st Layer Exposure			Corruption Exposure (most corrupt tercile)		
Has PPE		-0.371	-0.384*		-0.134	-0.213
		(-1.64)	(-1.69)		(-0.62)	(-0.92)
Corruption Variable	-0.958**		-0.121	-0.497		-0.454**
	(-2.07)		(-0.63)	(-1.16)		(-2.39)
Interaction		-0.998**	-0.893**		-1.252***	-0.881**
		(-2.41)	(-2.36)		(-3.18)	(-2.30)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	397	23,540	23,540	396	23,479	23,479
Adj. R^2	0.184	0.094	0.094	0.181	0.094	0.094

Table 9

Panama Papers exposure and tax aggressiveness

This table provides the returns of publicly listed firms around the Panama Papers data leak controlling for firms' tax aggressiveness. The dependent variables are *Cumulative abnormal returns* around three event days associated with the leaked Mossack Fonseca & Co. documents. The sample consists of all publicly listed firms with non-missing daily returns in the five days surrounding at least one of the three event dates. *Has Panama Papers Exposure* (*PPE*) is a dummy variable that takes the value of 1 if any entity, intermediary, or person listed in the leaked documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. In columns (1)-(3), *Tax Aggressiveness (constructed without FE)* is the residual of a regression of firm's *Tax Aggressiveness (Unadj. Floor)* on return on assets where *Tax Aggressiveness (Unadj. Floor)* is the statutory tax rate at the country level less a firm's effective tax rate. The effective tax rate is defined as tax over EBIT; observations with negative EBIT are denoted as missing. In columns (4)-(6), *Tax Aggressiveness (constructed with FE)* is the residual of a regression of firm's *Tax Aggressiveness (Unadj. Floor)* on return on assets, country fixed effects, and industry fixed effects. Controls include size and fixed effects as indicated. Appendix 1 provides the variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Tax Variable	Tax Aggressiveness (constructed without FE)			Tax Aggressiveness (constructed with FE)		
Has *PPE*		-0.518*	-0.519*		-0.529*	-0.532*
		(-1.80)	(-1.80)		(-1.84)	(-1.85)
Tax Variable	-2.518***		0.231	-2.493***		0.233
	(-2.98)		(1.23)	(-2.99)		(1.28)
Interaction		-1.640***	-1.855**		-1.672**	-1.890**
		(-2.71)	(-2.51)		(-2.23)	(-2.18)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	310	15,818	15,818	310	15,818	15,818
Adj. R^2	0.180	0.112	0.112	0.180	0.112	0.112

Table 10

Panama Papers exposure and reputation

This table provides the returns of publicly listed firms around the data leak controlling for firms' reputation. The dependent variable is *Cumulative abnormal returns* around three event days associated with the leaked Mossack Fonseca & Co. documents. The sample consists of all publicly listed firms with non-missing daily returns in the five days surrounding at least one of the three event dates. *Has Panama Papers Exposure* (*PPE*) is a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. Overall ESG is the natural logarithm of one plus a firm's overall Environmental, Social, and Governance score in 2015 taken from Bloomberg. Environmental, Social, and Governance are the respective natural logarithms of one plus a firm's environmental, social, and governance score taken from Bloomberg. Controls include size and fixed effects as indicated. Appendix 1 provides detailed variable definitions. Logarithms of ESG scores were demeaned for better legibility. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ESG Variable		Overall ESG Score		Environmental	Social	Governance
Has *PPE*		-0.547	-0.562	-1.217**	-0.861**	-0.085
		(-0.88)	(-0.90)	(-2.38)	(-2.17)	(-0.14)
ESG Variable	-1.067		-0.187	-0.331*	-0.164	1.279**
	(-0.60)		(-0.48)	(-1.80)	(-0.94)	(2.36)
Interaction		-2.213**	-2.103**	-0.572	-1.564***	-8.848***
		(-2.46)	(-2.07)	(-0.86)	(-5.56)	(-4.37)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	168	2,696	2,696	2,025	2,461	2,696
Adj. R^2	0.233	0.105	0.104	0.107	0.106	0.106

Appendix 1: Data Appendix

All continuous variables are winsorized at the 1% and 99% levels.

Description	Description (detailed)	Source
Alpha [a;b]	Cumulative *daily abnormal returns* in % from closing on day *a*-1 to closing of day *b* relative to some event date. *Daily abnormal returns* are obtained from parameters of a one-factor model estimated over days [−294; −41] relative to event dates. *Excess return on the market* is the return of the local index in U.S. dollars over and above the U.S. risk-free rate.	Datastream
Cumulative raw returns [a;b]	Cumulative *daily stock returns* in % from closing on day *a*-1 to closing of day *b* relative to some event date.	Datastream
Has Panama Papers Exposure	A dummy variable equal to 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. Persons are matched using exact home country matches and fuzzy name matches. Entities and intermediaries are matched using exact incorporation country matches and fuzzy name matches. All fuzzy matches have been hand-checked.	ICIJ, Orbis
Exposure of Observable Activity	A dummy variable equal to 1 if an entity in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no person and no intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	ICIJ, Orbis
Exposure of Secret Activity	A dummy variable equal to 1 if a person or an intermediary listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no entity in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	ICIJ, Orbis
Both Types of Exposure	A dummy variable equal to 1 if both an entity and a person or an intermediary in the leaked Mossack Fonseca & Co. documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	ICIJ, Orbis
Has TOP4 Haven Exposure	A dummy variable equal to 1 if a firm has at least one subsidiary in any of the four main tax havens used by Mossack Fonseca & Co. (Panama, British Virgin Islands, Bahamas, Seychelles).	Orbis
Has Sponsored ADR	A dummy variable equal to 1 if a firm is not headquartered in the U.S. and has a sponsored ADR in 2015.	BNY Mellon
Has Unsponsored ADR	A dummy variable equal to 1 if a firm is not headquartered in the U.S. and has an unsponsored ADR in 2015.	BNY Mellon
Has U.S. Subsidiary	A dummy variable equal to 1 if a firm is not headquartered in the U.S. and has a U.S. subsidiary in 2015.	Orbis
Is U.S. Firm	A dummy variable equal to 1 if a firm is headquartered in the U.S.	Orbis
Political 1st Layer Exposure	A dummy variable equal to 1 if a firm has at least one subsidiary in any of the countries whose presidents or major officials were implicated by the Panama Papers (Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, Ukraine, United Arab Emirates,).	Orbis
Exposure to Most Corrupt Tercile	A dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index.	Orbis, Transparency International
Tax Aggressiveness (Unadj. Floor)	The statutory tax rate at the country level less a firm's effective tax rate. The effective tax rate is defined as tax over EBIT. Observations with negative EBIT are denoted as missing.	KPMG, Orbis
Tax Aggressiveness (no FE)	The residual of a regression of firm's *Tax Aggressiveness (Unadj. Floor)* on return on assets. High values denote high tax aggressiveness.	KPMG, Orbis
Tax Aggressiveness (FE)	The residual of a regression of firm's *Tax Aggressiveness (Unadj. Floor)* on return on assets, country fixed effects, and industry fixed effects. High values denote high tax aggressiveness.	

Overall ESG Score	Log(1+Overall environmental, social and governance score), in 2015.	Bloomberg ESG database
Environmental	Log(1+Overall environmental score), in 2015.	Bloomberg ESG database
Social	Log(1+Overall social score), in 2015.	Bloomberg ESG database
Governance	Log(1+Overall governance score), in 2015.	Bloomberg ESG database
Total Assets	Total assets. Regressions use the natural logarithm.	Datastream
Number of Subsidiaries	Number of domestic and foreign subsidiaries.	
Has Foreign Subsidiary	Dummy variable equal to 1 if a firm has at least one subsidiary outside of its parent headquarter country.	Orbis
% Foreign Subsidiaries	Fraction of a firm's subsidiaries headquartered outside of its parent headquarter country.	Orbis
Number of Foreign Countries	Number of foreign countries in which firm has subsidiaries.	Orbis

Appendix 2: Firms Connected to the Panama Papers Data Leak by Industry

Industry	*N* Firms	*N* Panama Papers	Percent Panama Papers	Avg. *N* Subs.	Industry	*N* Firms	*N* Panama Papers	Percent Panama Papers	Avg. *N* Subs.
Trading	881	58	6.6	24	Wholesale	674	9	1.3	21
Mining	188	7	3.7	22	Automobiles and Trucks	307	4	1.3	31
Restaurants/Hotels	303	11	3.6	30	Construction Materials	625	8	1.3	19
Aircraft	56	2	3.6	52	Msrmt/Ctrl Equipment	159	2	1.3	33
Real Estate	795	27	3.4	45	Shipping Containers	88	1	1.1	16
Construction	499	13	2.6	37	Beer & Liquor	179	2	1.1	26
Apparel	192	5	2.6	26	other	7,432	83	1.1	17
Retail	620	16	2.6	33	Food Products	508	5	1	21
Insurance	39	1	2.6	81	Agriculture	220	2	0.9	15
Entertainment	163	4	2.5	25	Consumer Goods	365	3	0.8	23
Transportation	536	13	2.4	30	Printing and Publishing	127	1	0.8	27
Machinery	713	16	2.2	21	Chemicals	633	4	0.6	20
Banking	224	5	2.2	30	Computers	167	1	0.6	14
Recreation	91	2	2.2	13	Rubber and Plastic Products	200	1	0.5	13
Petroleum Gas	461	10	2.2	28	Pharmaceutical Products	634	3	0.5	17
Precious Metals	149	3	2	11	Electrical Equipment	498	2	0.4	18
Personal Services	156	3	1.9	25	Textiles	293	1	0.3	7
Coal	53	1	1.9	22	Defense	8	0	0	23
Business Services	1,708	32	1.9	23	Fabricated Products	67	0	0	7
Steel Works	417	7	1.7	17	Healthcare	153	0	0	67
Utilities	476	8	1.7	37	Shipbuilding, Railroad	51	0	0	28
Electronic Equipment	553	9	1.6	16	Tobacco Products	24	0	0	38
Medical Equipment	203	3	1.5	23					
Communication	433	6	1.4	29					
Business Supplies	219	3	1.4	22	**Total**	**23,540**	**397**	**1.7**	**23**